

Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

## NIA Project Registration and PEA Document

### Date of Submission

Mar 2018

### Project Reference Number

NIA\_UKPN0031

## Project Registration

### Project Title

Link Alert

### Project Reference Number

NIA\_UKPN0031

### Project Licensee(s)

UK Power Networks

### Project Start

February 2018

### Project Duration

3 years and 1 month

### Nominated Project Contact(s)

Rona Mitchell

### Project Budget

£275,600.00

## Summary

UK Power Networks have experienced disruptive link box failures over the last five years. Mitigations have been put in place to reduce the volume of these, and to limit the impact of this failure. However, there is more we could do to further reduce failures and we believe the root cause is high temperature and moisture ingress. In-situ monitoring of link boxes has not previously been conducted for a number of reasons, primarily because cost effective remote communications from link boxes has not been possible. This cost barrier has been compounded by the harsh environments link boxes are installed in with a lack of auxiliary supply and extremely poor radio reception. Due to this, link boxes require more frequent inspections than the majority of our assets which is expensive and resource-consuming. Having remote monitoring of link boxes will allow the time between inspections to be increased whilst concurrently improving the safety of the network.

Communication with link boxes were demonstrated in previous projects (SULVN and FUN-LV). In these trials, there were a number of data communication issues. These included missing measurement data and incorrect current direction. We believe advances in technology and our learnings from these other projects will enable us to develop a solution with higher reliability.

### Nominated Contact Email Address(es)

innovation@ukpowernetworks.co.uk

## Problem Being Solved

UK Power Networks have experienced disruptive link box failures over the last five years. Mitigations have been put in place to reduce the volume of these, and to limit the impact of this failure. However, there is more we could do to further reduce failures and we believe the root cause is high temperature and moisture ingress. In-situ monitoring of link boxes has not previously been conducted for a number of reasons, primarily because cost effective remote communications from link boxes has not been possible. This cost barrier has been compounded by the harsh environments link boxes are installed in with a lack of auxiliary supply and extremely poor radio reception. Due to this, link boxes require more frequent inspections than the majority of our assets which is expensive and resource-consuming. Having remote monitoring of link boxes will allow the time between inspections to be increased whilst concurrently improving the safety of the network.

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technology and our learnings from these other projects will enable us to develop a solution with higher reliability.

## Method(s)

The project will test prototypes and then install into link boxes remote monitoring equipment that can detect increases in temperature, moisture, current and voltage. The devices will remotely send a signal if there is any change. This will enable proactive response to investigate potential issues before a failure occurs.

The detailed project activities are as follows:

1. Identification of site locations where sensors are to be installed: The plan is to target high risk areas with older link boxes for the trials in a variety of environments.
2. Procurement: We will conduct an open tender to ask the market to demonstrate prototype devices. Products from selected bidders will be tested under controlled conditions that are not on a live network.
3. From the prototypes tested, we will select which one(s) will be developed and procured in numbers for a live network trial.
4. Install sensor systems at identified sites.
5. Data gathering from trials and analysis of data.
6. Reporting: This will include internal and external reporting for reviewing and communicating progress on the project. This includes the NIA Annual Progress and the Close Down reports.
7. Plan for business as usual rollout. Subject to the success of the trials, the rollout plan may include updating any policies and procedures relating to link box deployment as well as management of inspection and maintenance going forward.

## Scope

The project will install remote monitoring equipment into link boxes in a variety of environments, both urban and rural. It will include the monitoring and testing of both the sensor equipment and the communications platform. A 6-month trial period is proposed with appropriate review points to ensure it is progressing successfully. The project will include the development of appropriate documentation required for rollout if the trial is successful.

A time and budget extension was approved in April 2020 to lengthen the trial period and incorporate more time for data analysis and project closedown. To maximise the learnings from the project, the trial will gather data through winter and summer periods. This is to gather enough information to determine appropriate recommendations for seasonal and/or dynamic alarms.

## Objective(s)

The project objectives are two-fold:

1. Reliably communicate with devices installed under the bell cover of link boxes in a variety of environments.
2. Remotely monitor link boxes for abnormal running conditions and increases in temperature and moisture level.
3. Develop fault passage indicators which can be interrogated without lifting the bell cover of a link box.

## Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

## Success Criteria

The project will be deemed successful if the following is achieved:

1. Reliable communication with devices installed under the bell cover of link boxes in a variety of environments
2. Remote monitoring of link boxes for increases in temperature and moisture level.
3. Monitoring is conducted over a variety of link boxes to determine whether it is appropriate to roll out the technology as business as usual.
4. Understand whether this type of technology can be useful in network fault-finding activities
5. Enough information is gathered to decide whether or not it is appropriate to change the inspection regime for some link boxes to once every two years instead of yearly.

## Project Partners and External Funding

Suppliers to be determined following a tender process. No further external funding will be used for this project.

## Potential for New Learning

UK Power Networks expect to learn whether or not reliable communication can be achieved and whether the sensors trialed can provide meaningful warning of potential link box failures. This will be communicated to other DNOs through the project close-down report and relevant industry working group(s) that UK Power Networks attends.

## Scale of Project

It is proposed to trial approximately 100 sensors in link boxes in different environments across UK Power Networks' three license areas. This is deemed to be the smallest quantity that will produce meaningful results across a range of environments. This equates to 0.1% of all link boxes at UK Power Networks.

## Technology Readiness at Start

TRL5 Pilot Scale

## Technology Readiness at End

TRL8 Active Commissioning

## Geographical Area

The project will take place in a variety of locations across all three UK Power Networks' licence areas.

## Revenue Allowed for the RIIO Settlement

There is no revenue allowed in the RIIO-ED1 settlement for the remote monitoring of link boxes.

## Indicative Total NIA Project Expenditure

90% of the project value, equating to £248,040

## Project Eligibility Assessment Part 1

There are slightly differing requirements for RIIO-1 and RIIO-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RIIO-2 / RIIO-1).

### Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations (Please complete sections 3.1.1 and 3.1.2 for RIIO-2 projects only)

Please answer **at least one** of the following:

#### How the Project has the potential to facilitate the energy system transition:

n/a

#### How the Project has potential to benefit consumer in vulnerable situations:

n/a

### Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

#### Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

A roll-out of technology trialed in this project is estimated to achieve between £50k and £150k of savings per year across UK Power Networks. This includes a reduction in C/CMLs, savings in repair cost by carrying out proactive replacements, decrease in inspection frequency and a reduction in insurance claim costs associated with link box failures. An improvement in safety for employees and members of the public is difficult to quantify, and so has not been included in the calculations. Therefore, the value of safety improvement would be added to the estimated benefits.

#### Please provide a calculation of the expected benefits the Solution

The unit cost for inspecting a link box is £63. Inspections are conducted annually for high risk link boxes. If the project is successful, there is a potential to change inspection frequency to once every two years for link boxes that have remote communications. The average saving will then be £31.50 per link box per year.

Initial business roll-out estimate is to 7,000 high risk link boxes. This is 6% of our total link box population.

Base Cost:  $7000 * £63 = £441,000$  per annum

Method Cost:  $7000 * £63 / 2 = £220,500$  per annum

Expected Financial benefits:  $£441,000 - £220,500 = £220,500$  per annum

There are other benefits such as reduced insurance claims, reduced cost of repairs following a failure and reduced associated CIs and CMLs, but they are significantly lower in value.

#### Please provide an estimate of how replicable the Method is across GB

If this project is successful and the outputs deliver the benefits anticipated this could be rolled out to all link boxes in all DNOs in GB. The fleet of link boxes currently deployed across GB includes more than 280,000 units.

#### Please provide an outline of the costs of rolling out the Method across GB.

For a target price of £80-£100 per sensor system and based on an approximate number of link boxes across GB of 280,000, the cost of purchasing the technology for rollout out across all GB DNOs would be between £22.4m and £28m.

### Requirement 3 / 1

Involve Research, Development or Demonstration

A RIIO-1 NIA Project must have the potential to have a Direct Impact on a Network Licensee's network or the operations of the System Operator and involve the Research, Development, or Demonstration of at least one of the following (please tick which applies):

- A specific piece of new (i.e. unproven in GB, or where a method has been trialled outside GB the Network Licensee must justify repeating it as part of a project) equipment (including control and communications system software).
- A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)
- A specific novel operational practice directly related to the operation of the Network Licensees system
- A specific novel commercial arrangement

RIIO-2 Projects

- A specific piece of new equipment (including monitoring, control and communications systems and software)
- A specific piece of new technology (including analysis and modelling systems or software), in relation to which the Method is unproven
- A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information)
- A specific novel arrangement or application of existing gas transportation, electricity transmission or electricity distribution equipment, technology or methodology
- A specific novel operational practice directly related to the operation of the GB Gas Transportation System, electricity transmission or electricity distribution
- A specific novel commercial arrangement

## Specific Requirements 4 / 2a

### Please explain how the learning that will be generated could be used by the relevant Network Licensees

All Network Licenses operate link boxes, and have experienced disruptive failures. Remote monitoring will help reduce potential failures and reduce inspection frequency.

### Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

n/a

- Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

### Is the default IPR position being applied?

- Yes

## Project Eligibility Assessment Part 2

### Not lead to unnecessary duplication

A Project must not lead to unnecessary duplication of any other Project, including but not limited to IFI, LCNF, NIA, NIC or SIF projects already registered, being carried out or completed.

### Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

The work carried out in the SULVN and FUN-LV projects as mentioned on page one are very different to this project in two main ways:

The objective to work done previously was to change the way that the network was reconfigured. This was trialing link box switches in conjunction with smart circuit breakers at nearby distribution substations. The objective of Link Alert, as previously noted, is to monitor assets to enable proactive operation & maintenance.

The communications to and from link boxes in previous projects were not sufficiently reliable. This project aims to resolve this as well as to work on other stated objectives.

### If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

n/a

## **Additional Governance And Document Upload**

### **Please identify why the project is innovative and has not been tried before**

In-situ monitoring of link boxes has not previously been conducted for a number of reasons, primarily because cost effective remote communications from link boxes has not been possible. This cost barrier has been compounded by the harsh environments link boxes are installed in with a lack of auxiliary supply and extremely poor radio reception.

### **Relevant Foreground IPR**

n/a

### **Data Access Details**

n/a

### **Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities**

As there is currently no off-the-shelf solution which offers monitoring of link boxes with remote communications, there is a significant piece of development work in this project. Significant thermal and moisture monitoring of link boxes has not previously been done. While we estimate that temperature and moisture levels will in many ways correlate to adverse asset health, this has not yet been proven. As an unproven business case, the Network Licensee believes that it is appropriate to use NIA funding to developing the solution at this stage.

### **Please identify why the project can only be undertaken with the support of the NIA, including reference to the specific risks(e.g. commercial, technical, operational or regulatory) associated with the project**

As noted in the NIA guidance, certain projects are speculative in nature and yield uncertain commercial returns. This is the case with this project. There is commercial risk in that we are asking suppliers to develop new devices which may not eventually be transitioned to business as usual. This is because there is technical risk related to the fact that the maturity of the solution is not great. If the project is successful, the benefits for customers will be significant. As detailed in earlier sections, it has the potential to improve quality of supply, reduce number of disruptive link box failure and to reduce customer bills. It is also noted that the NIA guidance encourages Network Licensees to ensure that projects funded across NIA cover a broad range. To date there have been very few projects which have been looking to improve the performance of link boxes. This possibly because it has been difficult to identify improvements in this area, and that the risks involved with research & development are higher than would be generally acceptable in a private company.

### **This project has been approved by a senior member of staff**

Yes